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 - c. Contributing author(s): Mark Trueman
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 - f. Project name:
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1. Package checklist
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 3. Report documentation page
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 4. Table of contents
 5. Body of the manuscript
 6. Reference list

Michael Kaplan
MICHAEL KAPLAN
Director, Basic Research

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<p>This research presents the results of two experiments designed to complement the seven experiments reported earlier (The effects of heading in text). The present experiment examined the effects of different kinds of heading in different positions. The results indicated that headings aided recall, search and retrieval, but the kind and the position of the heading had no significant effect. A further three replication studies were then carried out, utilizing a different text, and a different population of readers. Headings were found to aid search and retrieval but not recall in these studies.</p> <p>Finally two more experiments are described which examined the effects of type o heading with lessable respondents. These experiments utilized both texts with the older age groups. There were no significant interactions between the kind of heading and the ability of the participants in either experiment. (SDW)</p>			
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Text

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I. RATINGS (extent to which criteria are met):

A. FOREWORD, EXECUTIVE SUMMARY (BRIEF): Are they clear? Are they consistent with the contents? Are they directed to target readers or users? Do they concisely highlight the important findings?

No __ Moderately __ Yes __ Substantially __

B. INTRODUCTION, BACKGROUND, OBJECTIVES: Is the literature review relevant to the research conducted (necessary and sufficient)? Is the statement of the problem pertinent to the target audience? Is it clear? Is it supported by concrete data or evidence?

No __ Moderately ✓ Yes __ Substantially __

C. APPROACH, METHOD: Is it appropriate? Was there a valid experimental design and data collection plan? Are they competently described and were they competently executed?

No __ Moderately ✓ Yes __ Substantially __

D. RESULTS: Are they clearly presented? Is there appropriate use of tables and figures? Were proper statistics used? Were they used correctly?

No __ Moderately ✓ Yes __ Substantially __

E. DISCUSSION AND CONCLUSIONS: Do they follow from the data and literature review? Are they comprehensible? Are conclusions and recommendations warranted and usable by intended audience?

No __ Moderately ✓ Yes __ Substantially __

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☐ Publish after minor revisions. (Comments may be made in Section III or as an enclosure.)

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Body of the manuscript

- ☒ 12. Text of report (with Tables and Figures).
 - a. All pages are present and numbered properly.
 - b. Text is print-ready copy.
 - c. Table of contents accurately indicates configuration of document.
- ☒ 13. Reference list (documents listed are cited in text).

Appendixes

- ☒ 14a. Included (they are necessary explanatory information).
- ☐ 14b. None prepared.

Signature of individual completing checklist.

A handwritten signature in cursive script, which appears to read "James H. Wallace", is written over a horizontal line.

FURTHER RESEARCH ON HEADINGS IN TEXT

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Further Research on Headings in Text

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20. A further three replication studies were then carried out, utilizing a different (easier) text, and a different (younger) population of readers. Headings were found to aid search and retrieval but not recall in these studies.

Finally two more experiments are described which examined the effects of type of heading (questions or statements) with less-able respondents. These experiments utilized both texts with the older age groups. There were no significant interactions between the kind of heading and the ability of the participants in either experiment.

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1.0 FOREWORD

1.1 Research on text design has focused on several interrelated features (e.g. see Hartley, 1978; 1980; 1981; Jonassen, 1982; 1984). There has been research on:

- the language of text;
- the spatial organization of text;
- the use of typographic cues; and
- the use of 'access structures' - devices which help the reader gain access to and move freely around the text.

The research on headings described in this report falls (mainly) into the last category. Headings are but one kind of access structure. Others include titles, summaries, numbering systems, indexes and bibliographies. Although headings can be considered as access structures, the other features listed above are also relevant to their design - how should headings be worded, where should they be positioned, how should they be denoted typographically, etc.?

1.2 The research on headings described in this report is one small part of all of the research on text design. Nonetheless it characterises a general approach to one specific issue. The main feature of this approach is to work steadily forward via repeated replication and extension.

2.0 INTRODUCTION TO THIS REPORT

2.1 In our previous report (Hartley and Trueman, 1982a) we described how we had carried out a series of experiments on the effects of headings in text. These experiments focused on:

- the position of headings (marginal vs text embedded);
- the kinds of headings used (questions vs statements); and
- the nature of the task - recall, search, or retrieval.

In the recall tasks the participants had to answer questions about a text after having read it; in the search tasks the participants had to look in the text and find answers to the questions; and in the retrieval tasks the participants had first to read the passage and then to look back in the text for answers to the questions.

In that report seven experiments were presented, and two more were required to complete the first series. These two experiments (described briefly below) were our first task in the present investigation.

2.2 The overall scheme of the nine experiments was as follows:
Experiments 1 and 2 were recall studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 1 and in the form of questions in Experiment 2.

Experiments 3 and 4 were search studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 3 and in the form of questions in Experiment 4.

Experiments 5 and 6 were retrieval studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 5 and in the form of questions in Experiment 6.

The results of the studies showed that there were no position effects in any of the three pairs of experiments. Accordingly:

Experiment 7 was a recall study, with headings in the form of statements or questions.

Experiment 8 was a search study, with headings in the form of statements or questions.

Experiment 9 was a retrieval study, with headings in the form of statements or questions.

- 2.3 These nine studies thus provide sufficient data to answer a series of questions. These questions and answers are briefly summarised here : more detail can be found in our two publications on the topic (Hartley and Trueman, 1982b; Hartley and Trueman, 1983).

2.4 What were the overall effects of headings?

All nine experiments produced an effect due to headings which was statistically significant in eight cases. The average results obtained and their associated probability values are shown in Table 1. In addition a meta-analysis (following Glass *et al.*, 1981) showed that the mean effect-size for headings was 0.47. This figure indicates that the average participant in the headings groups performed better than sixty-six percent of the participants in the no-headings groups.

Because we used total time measures it was not possible to see whether or not the effects of the headings were general or specific in the search and retrieval tasks. However, the recall tests scores from Experiments 1, 2 and 7 allowed us to examine whether the improvements that accrued to the headings groups were specific to certain questions or were more general. This analysis did show that some particular questions had reduced error rates in the headings groups but that these questions were not the same in each of the three experiments. Overall, then, the effects of headings were best characterised as general rather than specific.

2.5 How did the position of the headings affect the results?

Six experiments were concerned with comparing marginal with embedded headings. None of these studies produced any significant differences. Table 2 summarises the results. Clearly, in these experiments, with these materials and these participants, the position of headings had no effect upon recall, search and retrieval.

2.6 What were the effects of different kinds of headings (questions vs statements)?

Headings as questions were only directly compared with headings as statements in Experiments 7, 8, and 9. In these three experiments there were no significant differences between the results obtained with these two forms of headings. Table 3 summarises the results.

- 2.7 In short, headings proved effective for aiding recall, search and retrieval in this series of experiments. The results, of course, were specific to the text used (a one thousand word text about television viewing habits in the United Kingdom), and to the participants (14-15 year old pupils of mixed-ability) in these experiments.

TABLE 1: Gains for headings: A summary of the results from the nine experiments

		Mean result for headings	Mean result for controls	F value	Probability level	Effect size
Expts. 1	Recall scores	7.6	6.8	4.56	$p < .03$	0.33
2		6.5	5.8	6.28	$p < .01$	0.41
7		7.5	6.5	4.78	$p < .01$	0.60
Expts. 3	Search times	13.0	15.0	7.91	$p < .01$	0.44
4		11.9	13.4	4.04	$p < .05$	0.38
8		10.6	12.6	6.55	$p < .002$	0.59
Expts. 5	Retrieval times	8.0	10.2	14.20	$p < .001$	0.68
6		7.5	8.9	6.11	$p < .02$	0.46
9		7.8	9.0	2.90	$p < .06$	0.34

¹The effect-size is the difference between the mean of the experimental group and the mean of the control group divided by the standard deviation of the control group. The average effect-size is a statistic introduced by Glass and his colleagues (e.g. Glass *et al.*, 1981) for describing the size of the difference obtained when there is a large number of studies.

TABLE 2: The effects of the position of headings: A summary of the results from six experiments

		Mean result for marginal headings	Mean result for embedded headings
Expts. 1	Recall scores	7.6	7.5
2		6.4	6.6
Expts. 3	Search times	12.8	13.2
4		12.0	11.7
Expts. 5	Retrieval times	7.8	8.1
6		7.4	7.5

TABLE 3: The effects of headings as questions compared with those of headings as statements: A summary of the results from three experiments

		Mean result for headings as questions	Mean result for headings as statements
Expt. 7	Recall scores	7.7	7.3
Expt. 8	Search times	10.5	10.8
Expt. 9	Retrieval times	8.1	7.5

- 2.8 The next task we set ourselves was to see if the results could be replicated using a different passage and a different target population.

3.0 REPLICATION STUDIES

- 3.1 In order to attempt to replicate the studies described above we prepared a second text (entitled The Life of Louis Braille). This text was approximately the same length as the television passage (approximately three and a half pages of one-and-a-half-spaced typescript) but it had a Flesch readability index of eighty-four compared with that of fifty-five for the television passage. (That is to say it was suitable for 11 year olds as opposed to 15-17 year olds.) The Louis Braille passage contains more narrative and less facts than the television passage, and is perhaps best described as a semi-literary text. A copy of each passage is provided in the Appendix to this report, together with sample pages from the different experimental versions of the texts.
- 3.2 In these replication studies we used the same procedures as before in order to repeat our three basic experiments, viz.:
Experiment 10 studied recall
Experiment 11 studied search
Experiment 12 studied retrieval.
- 3.3 In Experiment 10, on recall, over one hundred pupils aged between 11 and 12 with a wide-ability range were allocated into three conditions (control, headings in text, headings in margin), with headings in the form of statements, and they were tested on their immediate recall of factual information. The results, shown in Table 4, indicated no significant differences between the recall scores of the control and the headings groups.
- 3.4 In Experiment 11, on search, over one hundred pupils aged between 11 and 12 with a wide-ability range were allocated into four conditions (two controls, headings in text, headings in margin), with headings in the form of statements. They were asked to search the text, without having first read it, and to indicate by circling the location of material which would answer ten factual questions. The results, shown in Table 5, indicated that headings significantly aided search ($t = 2.82$, $df\ 105$, $p < .01$).
- 3.5 In Experiment 12, on retrieval, approximately eighty pupils with a wide-ability range were allocated into four conditions (two controls, headings in text, headings in margin), with headings in the form of statements. The pupils were asked first to read the text for a period of six minutes, and then to search the text and locate material that would answer ten factual questions. The results, shown in Table 6, indicated that headings significantly aided retrieval ($t = 2.21$, $df\ 80$, $p < .01$).

TABLE 4: The effects of headings on the factual recall of 11-12 year old pupils. (Average recall scores out of 10 with (below) N in each group : headings in the form of statements.)

		Recall scores		Overall
Headings	Embedded	\bar{x} 7.0 N (31)	}	6.8 (61)
	Marginal	\bar{x} 6.7 N (30)		
Controls	Marginal	\bar{x} 6.2 N (41)		6.2 (41)

TABLE 5: Average search times (in minutes) to find and circle the answers to ten questions in unfamiliar text.

		Search times		Overall
Headings	Marginal	\bar{x} 10.1 N (27)	}	10.3 (53)
	Embedded	\bar{x} 10.4 N (26)		
Controls	Marginal	\bar{x} 12.1 N (25)	}	12.2 (54)
	Embedded	\bar{x} 12.2 N (29)		

TABLE 6: The average times taken (in minutes) to circle the answers to ten questions in familiar text.

		Retrieval times		Overall
Headings	Marginal	\bar{x} 6.1 N (19)	}	6.6 (40)
	Embedded	\bar{x} 7.1 N (21)		
Controls	Marginal	\bar{x} 7.6 N (21)	}	7.9 (42)
	Embedded	\bar{x} 8.2 N (21)		

- 3.6 The experiments on search and retrieval thus replicated the results found in earlier experiments. The experiment on recall did not, however, so do. The results were consistent, (i.e. groups with headings recalled more than groups without them), but the difference was not significant. This failure to replicate may be due to the smaller sample size used in the experiment, the different passages, the different age groups, or a combination of these factors.

An additional experiment, replicating Experiment 11, utilizing a larger sample has been conducted, but the data remain, as yet, to be analysed.

4.0 THE EFFECTS OF HEADINGS IN THE FORM OF QUESTIONS VERSUS HEADINGS IN THE FORM OF STATEMENTS WITH LOW-ABILITY READERS

- 4.1 Data on the ability of the participants was collected in most of the twelve studies reported above. These data were of special interest in Experiment 7 because earlier research conducted by the principal investigator had indicated that headings in the form of questions led to better recall than did headings in the form of statements with low-ability pupils. (See Hartley *et al.*, 1980; Hartley *et al.*, 1981.) The findings of Experiment 7 (although in the predicted direction), however, were not statistically significant in this respect. (See Hartley and Trueman, 1982b for details.)
- 4.2 A major problem with studies in this area, however, has been that the definition of low-ability has been both inconsistent and somewhat crude (largely because ability has only been a side-issue in these studies). So far we have simply accepted the schools' designation of low-ability (and this can vary in different schools).

In order to assess more efficaciously the effects of headings in the form of questions versus headings in the form of statements with low-ability respondents, we designed Experiment 13.

- 4.3 In this experiment approximately one hundred and ten low-ability pupils (as defined by three schools) aged between 14 and 15 years took part. Four versions of the Louis Braille passage were used - two with headings (either marginal or embedded) in the form of questions and two with headings (either marginal or embedded) in the form of statements. The participants were asked to read through the text once only at their own speed, and to answer ten factual recall questions (as in Experiment 9). When the task had been completed each participant completed a cloze-type reading test developed by the principal investigator (a composite version of the GAP and GAPADOL tests developed by McLeod and Anderson, 1973; McLeod and Unwin, 1970). This test allowed us to split the respondents into two groups of low-ability - those above and those below the average score obtained.

- 4.4 The results obtained from this enquiry are shown in Table 7. These results were not significantly different for either ability group.
- 4.5 These results did not support the previous research findings showing a superiority for headings in the form of questions with low-ability participants, although the results for the lowest-ability groups were in this direction. We thought, nonetheless, it would be of interest to replicate Experiment 13 using a more sophisticated measure of reading age, and a more difficult text.
- 4.6 In Experiment 14 one hundred and forty low-ability pupils (as defined by four schools) aged between 14 and 15 years took part. The participants read one of two versions of the television passage - one with headings in the form of questions embedded in the text, and one with headings in the form of statements embedded in the text. They were asked to read through the text once only at their own speed, and to answer the twelve-item factual recall test as used in Experiments 1, 2 and 7. When this task had been completed the participants then each completed the GAPADOL reading test (McLeod and Anderson, 1973). This is a cloze-type test, which provides a reading age for each respondent, and is more suited for these older pupils.
- 4.7 The average reading age of the sample was 13 years 10 months (S.D. \pm 30.6 months). This indicates that this sample were of generally low-ability. However, some forty percent (N = 58) of its members had a reading age which was equal to, or in excess of, their chronological age. As these subjects were clearly not of 'low-ability' they were omitted from further consideration. The average reading age of the remaining eighty-two pupils was 11 years 11 months.
- 4.8 Once again we were able to split this sample into sub-samples of low-ability pupils.
- 4.9 The results obtained from this enquiry are shown in Table 8. These results were not significantly different for either ability group.

5.0 SUMMARY OF THE EXPERIMENTS

- 5.1 This report describes the results obtained from seven additional experiments on headings. Experiments 8 and 9 completed the first set of nine experiments investigating the effects of the position of headings (marginal or embedded), the kind of headings (questions versus statements) and task demands (recall, search and retrieval). These studies showed clear benefits for headings in each of the three tasks, but no effects for different kinds of headings, or for different positions.
- 5.2 Experiments 10, 11, and 12 attempted to replicate these results with a younger population of readers (11-12 years as opposed to 14-15 years) and with an easier test (Flesch R.E. score of 84 as opposed to 55). Beneficial effects for headings were shown for search and retrieval tasks, but not for immediate recall.

TABLE 7. The average recall score out of 10 for low-ability pupils
(further sub-divided into two groups) from the Louis Braille
text with headings in the form of questions and headings in
the form of statements.

		Headings in the form of questions	Headings in the form of statements
Recall score of top half of the low-ability group	\bar{x} N	8.3 26	8.8 31
Recall score of bottom half of the low-ability group	\bar{x} N	7.3 28	6.9 23

TABLE 8. The average recall score out of 12 for low-ability pupils
(further sub-divided into two groups) from the television
viewing text with headings in the form of questions and
headings in the form of statements.

		Headings in the form of questions	Headings in the form of statements
Recall score of top half of the low-ability group	\bar{x} N	5.3 19	4.9 23
Recall score of bottom half of the low-ability group	\bar{x} N	5.5 26	4.9 14

- 5.3 Experiments 13 and 14 examined the effects of different kinds of headings (questions versus statements) with low-ability participants. Contrary to earlier research no significant effects were found.

6.0 CONCLUDING REMARKS

- 6.1 The findings concerning the role and position of headings described in our two reports may have a certain generality but they are, of course, restricted to the printed texts that we have used.

It might be expected, for example, that marginal headings would be superior to text-embedded ones when there are frequent headings, perhaps different levels of headings, and when the text is much more lengthy. When headings provide a 'running commentary' on the text, then such headings may be more effective if they are positioned in the margin. Such suppositions, however, yet remain to be tested.

- 6.2 Table 9 below (courtesy David Jonassen) lists some of the major variables that might be considered in experiments on headings and (by implication) in experiments on other access structures. It is clear from this table that the research described in this report has not exhausted all the possibilities by any means!
- 6.3 The implications of work on printed text for the setting of electronic text needs to be considered carefully (see, for example, Bork, 1983; Hartley, 1980). One of the main difficulties for the reader of electronic text is finding information, and moving freely about the text. It is likely that headings can aid here, although, with the small screen size commonly used (24 rows x 60 characters) there is little room for marginal headings, or for displaying text by using the spatial systems advocated by Hartley (1978, 1980). Experiments are needed, therefore, to examine the effects of colour-coded headings as retrieval devices in electronic text, as well as the efficacy of 'running heads'. These, and other implications of research on headings in printed text for the setting of electronic text are discussed more fully in Hartley and Jonassen (1984).
- 6.4 Finally, as noted in the foreword, headings form but a small sub-set of issues in the field of text design, and the research described in this report is but a part of a wider approach to the topic espoused by the author. In conclusion, therefore, it might be appropriate to consider the implications of this wider approach for the setting of the Final Reports for U.S. Army Research Contracts. The text of these reports is usually hierarchical in nature and clearly structured by the use of headings and paragraph numbering systems. However, the instructions given to authors concerning the typography of such reports prevent authors from using these devices to good effect. Appendix 2 of this report illustrates how this report might have looked, had the principal investigator been allowed to use his typographic expertise ...

TABLE 9: Possible experimental variables in studies on headings.

The variables may of course also be combined in different ways.

1. Form of headings
 - questions
 - statements
2. Position of headings
 - marginal
 - embedded
3. Frequency of headings
 - high
 - low
4. Depth of headings
 - single level
 - multiple levels
 - hierarchical (structural)
5. Source of headings
 - experimenter provided
 - subject generated
6. Type of passage
 - argumentative
 - expository
 - narrative
7. Individual differences, e.g.
 - reading ability
 - mental ability
 - conceptual style (relational/analytical)

TABLE 9 continued

Possible dependent variables

- A. Factual (verbatim) recall
 - completion
 - multiple-choice
- B. Comprehension
 - free recall
 - paraphrasing
 - completion
 - multiple-choice
 - task completion
- C. Structural knowledge
 - hierarchical fill-in
 - outlining
 - true-false judgements i.e. proximity
- D. Inference - prediction
 - completion
 - multiple-choice
- E. Evaluation
 - criterion given
 - determine criteria
 - determine criteria and evaluate
- F. Search task (time)
- G. Retrieval (time)
- H. Comprehension x level of structural importance
- I. Preferences

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8.0 REFERENCES

- Bork, A. A preliminary taxonomy of ways of displaying text on screens. Information Design Journal, 1983, 3, 3, 206-214.
- Glass, G.V., McGaw, B., and Smith, M.L. Meta-analysis in Social Research. Beverly Hills: Sage, 1981.
- Hartley, J. Designing Instructional Text. London: Kogan Page, 1978.
- Hartley, J. (Ed). The Psychology of Written Communication: Selected Readings. London: Kogan Page, 1980.
- Hartley, J. Eighty ways of improving instructional text. IEEE Transactions on Professional Communication, 1981, PC-24, 1, 17-27.
- Hartley, J., Kenelcy, J., Owen, G. and Trueman; M. The effects of headings on children's recall from text. British Journal of Educational Psychology, 1980, 50, 304-307.
- Hartley, J. and Jonassen, D. Headings in printed and electronic text. In D. Jonassen (Ed) The Technology of Text Vol. 2. Englewood Cliffs, N.J.: Educational Technology Publications, 1984 (in press).
- Hartley, J., Morris, P. and Trueman, M. Headings in text. Remedial Education, 1981, 16, 5-7.
- Hartley, J. and Trueman, M. The effects of headings in text. Final Report to U.S. Army Research Institute for the Behavioral and Social Sciences, May, 1982(a).
- Hartley, J. and Trueman, M. Headings in text : issues and data. Paper prepared for the 20th International Congress of Applied Psychology, Edinburgh, July, 1982(b).
- Hartley, J. and Trueman, M. The effects of headings in text on recall, search, and retrieval. British Journal of Educational Psychology, 1983, 53, 205-214.
- Jonassen, D. (Ed) The Technology of Text: Principles for Structuring, Designing and Displaying Text. Englewood Cliffs, N.J.: Educational Technology Publications, 1982.
- Jonassen, D. (Ed) The Technology of Text Vol. 2. Englewood Cliffs, N.J.: Educational Technology Publications, 1984 (in press).
- McLeod, J. and Anderson, J. GAPADOL Reading Comprehension Test. London: Heinemann Educational, 1973.
- McLeod, J. and Unwin, D. GAP Reading Comprehension Test. London: Heinemann Educational, 1970.

9.0 PUBLICATIONS AND PAPERS ARISING
FROM THIS RESEARCH

- Hartley, J. and Trueman, M. Headings in text : issues and data.
AERA Annual Convention, Los Angeles, 1982.
- Hartley, J. and Trueman, M. The effects of headings in text.
Final Report to U.S. Army Research Institute for the Behavioral
and Social Sciences, 1982.
- Hartley, J. and Trueman, M. The effects of headings in text on recall,
search, and retrieval. British Journal of Educational Psychology,
1983, 53, 205-214.
- Hartley, J. and Jonassen, D. The role of headings in printed and
electronic text. In D. Jonassen (Ed) The Technology of Text Vol. 2.
Englewood Cliffs, N.J.: Educational Technology Publications, 1984.
- Hartley, J., Trueman, M. and Pigram, J. The effects of headings in the
form of questions versus headings in the form of statements with
low-ability pupils. AERA Annual Convention, New Orleans, April, 1984.

Appendices

These appendices provide copies of the passages and the tests used in the experiments reported, together with illustrative pages of different settings of the text. In addition some sample pages of this report are presented in a revised typographic setting based on Hartley (1978).

<u>Appendix</u>	<u>Page</u>
1 The television viewing passage (with marginal headings in the form of questions)	A2 - A7
2 The Louis Braille passage (with marginal headings in the form of statements)	A8 - A13
3 One page example of a control passage (text with the same width as Appendices 1 and 2)	A14 - A15
4 One page example of text (with embedded headings as questions)	A16 - A17
5 One page example of text (with embedded headings as statements)	A18 - A19
6 One page example of a control passage (text with the same width as Appendices 4 and 5)	A20 - A21
7 Sample pages of this report produced in a revised typographic setting based on Hartley (1978)	A22 - A26

Appendix 1.

The television viewing passage (with marginal headings in the form of questions).

WATCHING TELEVISION TODAY!

This article describes the results from a recent questionnaire on watching television. The following topics are discussed:

- the time spent watching television
- the people's favourite programmes
- attitudes to the BBC
- attitudes to ITV
- attitudes to television in general
- suggestions for improvement

How much time (hours
per week) do people
spend watching
television?

The replies showed that fifty percent of the people who completed the questionnaire watched between 10 and 20 hours of television a week. A further twenty percent watched between 5 and 10 hours. As you would expect, older people spent longer watching television than younger.

Television, however, did not dominate the lives of those who answered the questionnaire. Three-quarters of them thought that television was less important than their holidays. Sixty-five percent of them thought that television was less important than books. And, whatever their age or sex, only twenty-five percent planned their viewing in advance.

What are the most
popular programmes?

When people came to their favourite programmes nearly seventy percent put documentary programmes at the top of the list. This was followed by the news, drama series, plays, comedies, sport and old films.

There were interesting sex differences. Sixty-five percent of the men mentioned documentaries as their favourite type of programme compared with only forty percent of the women. Women, overall, preferred drama series to any other type of programme.

In particular women disliked sport, a subject favoured by forty percent of the men. Men ranked sport fourth - following documentaries, news and comedies.

People under 25 were less interested in plays and news than were the others. They ranked old films above sport, a startling contrast to the over 65's where only ten percent liked old films.

How do people react
to BBC programmes?

More than fifty percent of those who replied were fairly satisfied with the BBC and fourteen percent of them seemed delighted with it. Indeed, only sixteen percent were dissatisfied. The most popular channel was BBC 1. This was watched by two out of every three people. Ten percent said they watched BBC 2 most (a figure far higher than the commonly quoted seven percent for Britain as a whole). But fewer of the younger generation, the people under 25, watched BBC 2. Only fifteen percent of this age group watched BBC 2 : seventy-five percent said they preferred BBC 1.

The main complaint about the BBC was with the number of repeats. Men were unhappy with the intellectual level of many of the programmes. Women were upset by clashes between similar programmes and by the showing of old films.

How do people react
to ITV programmes?

The overall picture for ITV was very different. Over fifty percent of those who replied to the questionnaire were unhappy with the ITV programmes, and only two percent said they watched the commercial channel the most. Twenty percent found viewing ITV annoying because of the advertising breaks, and this figure rose to thirty-three percent for viewers over 50 years of age. The dislike of ITV showed up again in the fact that only six out of ten viewers bothered to list their favourite commercial. However, the most popular commercial - by a large margin - was the P.G. Tips tea-swilling chimpanzees. This was in fact especially liked by the over-50's.

Fewer of those who replied seemed to mind the repeats and old films on ITV. But another grumble - on all channels - was about the number of American programmes and the amount of sex and violence. The over-65's were particularly unhappy with the ITV for this reason.

How do people respond
to television
programmes in general?

So, overall, the responses to the questionnaire reveal a previously silent minority. A minority group desperate for better programmes. People who find television advertising disrupting. People who dislike the repeats on BBC TV. People who resent the way two similar programmes are screened at the same time, and people who find television trivial and boring.

Nearly thirty-three percent of those who replied liked radio better than television. One wrote that radio 'was the more adult form of broadcasting'. And a third liked their record players and their stereo equipment more than their televisions. Nearly a half of the under 25's (who preferred their radios) also regarded their record players as more important, and ninety percent of them put their holidays before television.

How do people suggest
that television can
be improved?

Seventy-five percent of those who completed the questionnaire were against more televising hours, and were in favour of the present allocation of channels. Twenty percent thought there should be no commercial television at all.

The most popular way to improve the quality of television, suggested by fifty percent, was to reduce the number of programmes containing crime, violence, and sexual references or activity. Other suggestions for improving television included having the same sort of division there is on radio, with each channel concentrating on one kind of programme. But on the whole there was a tolerance and a certain charity about television's failings, and praise for its good points. As one person put it, 'If television were completely satisfactory one would be loathe to miss anything. Let it be'.



Please write short answers to the following questions:

1. One in three people said TV programmes were trivial and _____?
(write in the missing word)
2. What programmes did women viewers like best? _____
3. What percentage of viewers were against more televiewing hours? _____%
4. What was the favourite commercial? _____
5. What percentage of viewers were dissatisfied with BBC programmes? _____%
6. Give two of the most popular suggestions made for improving the programmes.

7. What percentage of viewers planned their viewing in advance? _____%
8. What percentage of viewers liked radio better than television? _____%
9. What was the most popular kind of programme? _____
10. What was the main complaint about BBC programmes? _____
11. What percentage of viewers were unhappy with the ITV programmes?
Over _____%
12. How many hours per week did most people spend watching TV? _____ hours

Name _____ Form _____ Sex _____

Appendix 2.

The Louis Braille passage (with marginal headings as statements).

Louis Braille (1809-1852)

Louis' early childhood

Louis Braille's father lived in an old French village called Coupvray and worked as a saddler. He used one of the rooms in his small stone cottage as his workroom. In this room he kept an old bench and chair, and the tools and knives of his trade. There were skins and scraps of leather, and boxes of nails. There were harness, partly finished saddles and the smell of leather always hung upon the air.

At three years of age Louis was a bright and happy little boy, with his fingers into everything. He loved watching his father at work, and playing with odd strips of leather that fell to the floor.

His father, of course, was careful to keep the sharp scissors and knives out of Louis' reach. He liked having the child with him, and he sometimes wondered whether Louis too would be a saddler when he grew up, but this was not to be.

A terrible accident at the age of three

One day Louis had a terrible accident. No one seemed quite sure how it happened. Perhaps the child had grown tall enough to touch the tools that his father thought were beyond his reach. Perhaps he went into the workshop when no one was there. Somehow he got hold of a knife and a piece of leather. The next moment the knife slipped and he had injured his eye. Within a few months the other eye grew dim too, and by the time he was five, Louis was quite blind.

Early school days

In those days little was done for blind children. When Louis went to the village school a year or two later he could only learn by listening. He listened to the teacher carefully so that he would not miss a word. He worked hard, and found that he could often answer questions more easily than the other children who had books and pictures to help them.

All the same, he knew that without being able to read books he would never know very much about all the things that interested him. Why, he could not even write his name! He did not even know what it looked like.

Soon, however, Louis made friends with other boys, and became interested in lessons. The lessons of course were usually lists of things to be learned by heart. The school also had a clumsy way of teaching reading. It used thin cardboard pages with raised letters on them. The letters, of course,

had to be large, and a whole book was very thick indeed. The blind boys could feel the letters, but it was a slow and difficult way of reading. Even so, Louis did well with it.

Louis seemed to do well in many things. He learned to play the organ. He was good at making things with his hands, and he could even write a little.

A new way of teaching reading

When Louis was twelve, a new way of reading was tried at the school. It was called Night Reading and it had been invented by a captain in the army so that soldiers could read in the dark. Night Reading used a set of dots and dashes punched on to cardboard. The dots and dashes were set in groups. Each group meant a certain sound. They were raised up so that soldiers could feel them in the dark. It was a good idea for the army, but it was much too difficult for ordinary use. However, the idea gave Louis great hope, and there, at the age of twelve, his life-work really began.

Changes to Night Reading

The Night Reading gave him a start. It needed changing. It needed to be more simple. In all his spare time Louis worked on it. He worked after school at night. He worked at home in the holidays. Somehow he had to find an easy way for blind people to read with their fingers. He worked on it for a year, two years, three years.

By the time he was fifteen he had turned the Night Reading "upside down and created it anew". He had made a sign for each separate letter, as well as for such things as full stops and commas and notes of music.

His friends at school tried it out. They were pleased because each sign was just small enough for them to feel with their finger tips. Even then Louis did not stop working on his alphabet. He found that his friends could feel dots more easily than they could feel dashes. The dashes must come out.

Finally: The Braille alphabet

For five more years Louis worked until at last he had made the Braille alphabet that is used for the blind today. The sign for each letter was made up of dots. It was made of one dot, or any number up to six grouped in different ways.

The boys could learn it easily. Also, they could write in Braille themselves by using a punching tool and a special frame. Thus they could take notes in lessons. They could learn spellings. They could write what they wished, and read it over again later with their finger tips.

The boys at the school of course had grown to be men by now. As learning was so slow for most of them it was not unusual for them to stay until they were over twenty. They were full of praise for their friend's new alphabet. It opened doors for them that had long been closed. If books could be printed in this way for blind people, then all the knowledge of the earth could be spread before them.

The contribution of Louis Braille

The Braille alphabet is now used all over the world. Thousands of books and newspapers are printed in Braille every year. There are now many schools for the blind. Children in these schools learn to read Braille with their finger tips almost as easily as a seeing child can learn to read ordinary print. Blind people everywhere are grateful to the quiet, kind, hard-working Frenchman, Louis Braille.

The family cottage still stands in the village. The saddler's workshop is still there with its bench and tools and saddles, but in these days it is kept as a museum. France is proud of the old stone cottage, for in it was born one of her greatest men.

1. How did Louis learn at the village school before going to Paris?
2. What kind of tool did people use to write in Braille?
3. What is the family cottage kept as today?
4. What did Louis Braille's father do for a living?
5. Why did Louis decide that the dashes must come out of his alphabet?
6. What sort of nails did Louis' father use to help Louis 'see' his name?
7. How many dots can be used to represent one letter in the Braille alphabet?
8. Why did the army captain invent Night Reading?
9. How did Louis feel at first at school in Paris?
10. Why did the schoolmaster and the priest suggest that Louis should go to school in Paris?
11. What was the clumsy way of teaching reading used by the school in Paris before the invention of Night Reading?
12. What happened to Louis after his terrible accident by the time he was five?

Please add here:

Name _____ Sex _____

Form _____

Appendix 3.

One page example of control passage (text with the same width as
Appendices 1 and 2).

WATCHING TELEVISION TODAY!

This article describes the results from a recent questionnaire on watching television. The following topics are discussed:

- the time spent watching television
- the people's favourite programmes
- attitudes to the BBC
- attitudes to ITV
- attitudes to television in general
- suggestions for improvement

The replies showed that fifty percent of the people who completed the questionnaire watched between 10 and 20 hours of television a week. A further twenty percent watched between 5 and 10 hours. As you would expect, older people spent longer watching television than younger.

Television, however, did not dominate the lives of those who answered the questionnaire. Three-quarters of them thought that television was less important than their holidays. Sixty-five percent of them thought that television was less important than books. And, whatever their age or sex, only twenty-five percent planned their viewing in advance.

Appendix 4.

One page example of text with embedded headings as questions.

Louis Braille (1809-1852)

What was Louis Braille's early childhood like?

Louis Braille's father lived in an old French village called Coupvray and worked as a saddler. He used one of the rooms in his small stone cottage as his workroom. In this room he kept an old bench and chair, and the tools and knives of his trade. There were skins and scraps of leather, and boxes of nails. There were harness, partly finished saddles and the smell of leather always hung upon the air.

At three years of age Louis was a bright and happy little boy, with his fingers into everything. He loved watching his father at work, and playing with odd strips of leather that fell to the floor.

His father, of course, was careful to keep the sharp scissors and knives out of Louis' reach. He liked having the child with him, and he sometimes wondered whether Louis too would be a saddler when he grew up, but this was not to be.

What happened at the age of three?

One day Louis had a terrible accident. No one seemed quite sure how it happened. Perhaps the child had grown tall enough to touch the tools that his father thought were beyond his reach. Perhaps he went into the workshop when no one was there. Somehow he got hold of a knife and a piece of leather. The next moment the knife slipped and he had injured his eye. Within a few months the other eye grew dim too, and by the time he was five, Louis was quite blind.

How did Louis learn at school?

In those days little was done for blind children. When Louis went to the village school a year or two later he could only learn by listening. He listened to the teacher carefully so that he would not miss a word. He worked hard, and found that he could often answer questions more easily than the other children who had books and pictures to help them.

All the same, he knew that without being able to read books he would never know very much about all the things that interested him. Why, he could not even write his name! He did not even know what it looked like.

Appendix 5.

One page example of text with embedded headings as statements.

WATCHING TELEVISION TODAY!

This article describes the results from a recent questionnaire on watching television. The following topics are discussed:

- the time spent watching television
- people's favourite programmes
- attitudes to the BBC
- attitudes to ITV
- attitudes to television in general
- suggestions for improvement

Time spent (hours per week) watching television

The replies showed that fifty percent of the people who completed the questionnaire watched between 10 and 20 hours of television a week. A further twenty percent watched between 5 and 10 hours. As you would expect, older people spent longer watching television than younger.

Television, however, did not dominate the lives of those who answered the questionnaire. Three-quarters of them thought that television was less important than their holidays. Sixty-five percent of them thought that television was less important than books. And, whatever their age or sex, only twenty-five percent planned their viewing in advance.

Appendix 6.

A one page example of a control passage (text the same width as
Appendices 4 and 5).

Louis Braille (1809-1852)

Louis Braille's father lived in an old French village called Coupvray and worked as a saddler. He used one of the rooms in his small stone cottage as his workroom. In this room he kept an old bench and chair, and the tools and knives of his trade. There were skins and scraps of leather, and boxes of nails. There were harness, partly finished saddles and the smell of leather always hung upon the air.

At three years of age Louis was a bright and happy little boy, with his fingers into everything. He loved watching his father at work, and playing with odd strips of leather that fell to the floor.

His father, of course, was careful to keep the sharp scissors and knives out of Louis' reach. He liked having the child with him, and he sometimes wondered whether Louis too would be a saddler when he grew up, but this was not to be.

One day Louis had a terrible accident. No one seemed quite sure how it happened. Perhaps the child had grown tall enough to touch the tools that his father thought were beyond his reach. Perhaps he went into the workshop when no one was there. Somehow he got hold of a knife and a piece of leather. The next moment the knife slipped and he had injured his eye. Within a few months the other eye grew dim too, and by the time he was five, Louis was quite blind.

In those days little was done for blind children. When Louis went to the village school a year or two later he could only learn by listening. He listened to the teacher carefully so that he would not miss a word. He worked hard, and found that he could often answer questions more easily than the other children who had books and pictures to help them.

All the same, he knew that without being able to read books he would never know very much about all the things that interested him. Why, he could not even write his name! He did not even know what it looked like.

Appendix 7

Sample pages of a revised typographic setting based on Hartley (1978).

The specification for the revised text is as follows:

Main headings:	Capitals - ranged left (4 line feeds above, 2 below).
Secondary headings:	Lower-case underlined - ranged left (1 line feed above, none below).
Text width:	140 mm (approx.) Margin 70 mm for text, 60 mm for paragraph numbers.
Text spacing:	One and a half typescript.
Line-endings:	No line to end with first word of a new sentences.

1.0 FOREWORD

1.1 Research on text design has focused on several interrelated features (e.g. see Hartley, 1978; 1980; 1981; Jonassen, 1982; 1984). There has been research on:

- the language of text;
- the spatial organization of text;
- the use of typographic cues; and
- the use of 'access structures' - devices which help the reader gain access to and move freely around the text.

The research on headings described in this report falls (mainly) into the last category. Headings are but one kind of access structure. Others include titles, summaries, numbering systems, indexes and bibliographies. Although headings can be considered as access structures, the other features listed above are also relevant to their design - how should headings be worded, where should they be positioned, how should they be denoted typographically, etc.?

1.2 The research on headings described in this report is one small part of all of the research on text design. Nonetheless it characterises a general approach to one specific issue. The main feature of this approach is to work steadily forward via repeated replication and extension.

2.0 INTRODUCTION TO THIS REPORT

2.1 In our previous report (Hartley and Trueman, 1982a) we described how we had carried out a series of experiments on the effects of headings in text.

These experiments focused on:

- the position of headings (marginal vs text embedded);
- the kinds of headings used (questions vs statements);
and
- the nature of the task - recall, search, or retrieval.

In the recall tasks the participants had to answer questions about a text after having read it; in the search tasks the participants had to look in the text and find answers to the questions; and in the retrieval tasks the participants had first to read the passage and then to look back in the text for answers to the questions.

In that report seven experiments were presented, and two more were required to complete the first series. These two experiments (described briefly below) were our first task in the present investigation.

2.2 The overall scheme of the nine experiments was as follows: Experiments 1 and 2 were recall studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 1 and in the form of questions in Experiment 2.

Experiments 3 and 4 were search studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 3 and in the form of questions in Experiment 4.

Experiments 5 and 6 were retrieval studies, with headings in two positions (marginal and embedded), and headings in the form of statements in Experiment 5 and in the form of questions in Experiment 6.

The results of the studies showed that there were no position effects in any of the three pairs of experiments. Accordingly:

Experiment 7 was a recall study, with headings in the form of statements or questions.

Experiment 8 was a search study, with headings in the form of statements or questions.

Experiment 9 was a retrieval study, with headings in the form of statements or questions.

- 2.3 These nine studies thus provide sufficient data to answer a series of questions. These questions and answers are briefly summarised here : more detail can be found in our two publications on the topic (Hartley and Trueman, 1982b; Hartley and Trueman, 1983).

2.4 What were the overall effects of headings?

All nine experiments produced an effect due to headings which was statistically significant in eight cases. The average results obtained and their associated probability values are shown in Table 1. In addition a meta-analysis (following Glass et al., 1981) showed that the mean effect-size for headings was 0.47. This figure indicates that the average participant in the headings groups performed better than sixty-six percent of the participants in the no-headings groups.

Because we used total time measures it was not possible to see whether or not the effects of the headings were general or specific in the search and retrieval tasks. However, the recall tests scores from Experiments 1, 2 and 7 allowed us to examine whether the improvements that accrued to the headings groups were specific to certain questions or were more general. This analysis did show that some particular questions had reduced error rates in the headings groups but that these questions were not the same in each of the three experiments. Overall, then, the effects of headings were best characterised as general rather than specific.

2.5 How did the position of the headings affect the results?

Six experiments were concerned with comparing marginal with embedded headings. None of these studies produced any significant differences. Table 2 summarises the results. Clearly, in these experiments, with these materials and these participants, the position of headings had no effect upon recall, search and retrieval.

2.6 What were the effects of different kinds of headings (questions vs statements)?

Headings as questions were only directly compared with headings as statements in Experiments 7, 8 and 9. In these three experiments there were no significant differences between the results obtained with these two forms of headings. Table 3 summarises the results.

2.7 In short, headings proved effective for aiding recall, search and retrieval in this series of experiments. The results, of course, were specific to the text used (a one thousand word text about television viewing habits in the United Kingdom), and to the participants (14-15 year old pupils of mixed-ability) in these experiments.

2.8 The next task we set ourselves was to see if the results could be replicated using a different passage and a different target population.